# INTERNATIONAL STANDARD



First edition 2000-06-01

# Imaging materials — Polyester-base magnetic tape — Storage practices

Matériaux pour image — Bande magnétique à base de polyester — Pratiques d'emmagasinage

# iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 18923:2000 https://standards.iteh.ai/catalog/standards/sist/c218858a-33c0-47cd-b822-1fe026b5e7cd/iso-18923-2000



Reference number ISO 18923:2000(E)

#### PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

# iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 18923:2000 https://standards.iteh.ai/catalog/standards/sist/c218858a-33c0-47cd-b822-1fe026b5e7cd/iso-18923-2000

© ISO 2000

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office Case postale 56 • CH-1211 Geneva 20 Tel. + 41 22 749 01 11 Fax + 41 22 734 10 79 E-mail copyright@iso.ch Web www.iso.ch

Printed in Switzerland

## Contents

Page

Forewo	ord	.v
Introdu	ntroductionvi	
1	Scope	.1
2	Normative references	.1
3	Terms and definitions	.2
4	Environmental conditions	.5
5	Materials	.7
6	Enclosures	.7
7	Preparation	.8
8	Storage housing	.9
9	Storage rooms	.9
10	Fire-protective storage	10
11	Identification, inspection, and cleaning D.A.R.D. PREVIEW	10
Annex	A (informative) Numbering system for related International Standards	11
Annex	B (informative) Stability of cellulose triacetate base	12
Annex	C (informative) Distinction between master tapes and work copies	13
Annex	D (informative) Temperature/relative humidity relationship	14
Annex	E (informative) Temperature and humidity acclimatization	15
Bibliog	raphy	17
Table 1	Maximum temperature and relative humidity for storage	.6

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 18923 was prepared by Technical Committee ISO/TC 42, Photography.

This International Standard is one of a series of standards dealing with the physical properties and stability of imaging materials. To facilitate identification of these International Standards, they are assigned a number within the block from 18900 to 18999 (see annex A).

Annexes A to E of this International Standard are for information only.

ISO 18923:2000 https://standards.iteh.ai/catalog/standards/sist/c218858a-33c0-47cd-b822-1fe026b5e7cd/iso-18923-2000

## Introduction

Magnetic tape is an important material in the capturing of information and has had widespread use in audio, video, and computer applications over the past 60 years. Preservation of this information is becoming of increasing concern to society, particularly as the recorded information becomes older and frequently of greater value to libraries, archives, museums, government agencies, and commercial organizations. Magnetic tape is also widely used by individual consumers to preserve records of personal or entertainment value.

The retrievability of the information on magnetic tape is dependent upon that of the complete magnetic system. This includes the stability of the tape itself, the equipment on which it is run and, in some systems, upon the necessary software. It is recognized that tape records will eventually have to be copied or transferred to another material when the system becomes obsolete. Nevertheless, it is advantageous to prolong the tape life so that the material does not become the controlling factor.

Although there have been many studies of tape stability, International Standards do not exist against which tape life can be evaluated. Likewise, International Standards are not available on the life expectancy of hardware and the problems associated with hardware wearing out or becoming obsolete. Therefore, the best approach for tape users is to store magnetic tape under conditions that will extend its life and to handle tape so that it will not be subjected to stress and undergo physical breakdown during use. This International Standard addresses the concerns of storage.

A major component of magnetic tape is the plastic base. Early audio-magnetic tape was manufactured on a variety of base materials, including paper, various vinyl esters, and cellulose esters. After extended storage, or storage under adverse conditions, the cellulose triacetate base decomposes and produces acetic acid (see informative annex B). However, since the 1960s, magnetic tape has been coated onto a polyester base that has excellent longterm stability. This International Standard was developed specifically for polyester-base tapes. However, it is also applicable to the storage of triacetate-base tapes even though the triacetate base is not as stable.

#### 1fe026b5e7cd/iso-18923-2000

The second component of magnetic tape is the oxide (or metal particle) binder layer which determines the magnetic characteristics. A magnetic characteristic of importance in the aging behaviour of tape is the development of print-through of analog tape. However, both research and use have clearly demonstrated that the critical concerns are primarily changes in physical properties, not the loss of magnetic characteristics. Upon use and aging, there may be changes in the friction properties, abrasivity, binder-base adhesion, and binder cohesion that render the tape unusable. Many of these changes occur as a result of binder degradation. Unfortunately, the user has no practical means of determining the stability of the composite tape and must rely on the studies of the manufacturer.

Regardless of the inherent stability of the binder layer, it is known that good storage conditions will extend the life of all tapes. While a good storage environment cannot reverse all the degradation that has already occurred, it can slow down additional deterioration.

NOTE Some degraded tape can be rendered temporarily playable by a variety of specialized procedures.

Two storage conditions are described in this International Standard. Medium-term storage conditions are recommended for tape with an expected useful life of ten years, while extended-term storage conditions are intended for tape with an expected life of fifty years. The conditions given in this storage recommendation represent a compromise between maximizing the tape life, considerations of convenience, and the cost of building and maintaining a storage facility.

# iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 18923:2000 https://standards.iteh.ai/catalog/standards/sist/c218858a-33c0-47cd-b822-1fe026b5e7cd/iso-18923-2000

# Imaging materials — Polyester-base magnetic tape — Storage practices

## 1 Scope

This International Standard provides recommendations concerning the storage conditions, storage facilities, enclosures, and inspection for recorded polyester-base magnetic tapes in roll form. It covers analog and digital tape and includes tape made for audio, video, instrumentation and computer use.

This International Standard is applicable to medium-term and extended-term storage of magnetic tape as defined in 3.18 and 3.7 and also is applicable to magnetic-tape records intended as master tapes, which should not be in frequent use.

Deviations from these recommendations, whether before or after recording, may result in shortened life expectancy. For example, adverse conditions during shipment, handling, or usage.

This International Standard is not applicable to "work" or "use" copies (see informative annex C).

## (standards.iteh.ai)

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

NFPA 75-1995, *Electronic computer/Data processing equipment.*<sup>1)</sup>

NFPA 90A-1996, Installation of air conditioning and ventilating systems.<sup>1)</sup>

NFPA 232-1995, *Protection of records*.<sup>1)</sup>

ASHRAE, Equipment. 1988.<sup>2)</sup>

ASHRAE, Handbook of fundamentals. 1988.<sup>2)</sup>

ASHRAE, Systems. 1987.<sup>2)</sup>

<sup>1)</sup> Available from the National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101, USA.

<sup>2)</sup> Available from the American Society of Heating, Refrigeration and Air Conditioning Engineers, 1791 Tullie Circle, NE Atlanta, GA 30329, USA.

## 3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

#### 3.1

#### aperture

window

opening on the flange that is used to facilitate threading of magnetic tape on the hub and inspection of the wind

## 3.2

#### base

support in a recording material on which the magnetic layer (and, if necessary, the back layer) is coated

#### 3.2.1

#### cellulose-acetate base

base for recording materials composed mainly of cellulose esters of acetic acid

#### 3.2.2

#### polyester base

base for recording materials composed mainly of a polymer of ethylene glycol and terephthalic acid (also referred to as polyethylene terephthalate), or a polymer of ethylene glycol and 2,6 naphthalene dicarboxylic acid (also referred to as polyethylene naphthalate)

#### 3.3

## cartridge

housing for a roll of recording material, such as photographic film or magnetic tape, attached to a single hub or reel

SEE cassette (3.4).

# (standards.iteh.ai)

## 3.4

## ISO 18923:2000

cassette https://standards.iteh.ai/catalog/standards/sist/c218858a-33c0-47cd-b822housing for a roll of recording material, such as photographic film\_or magnetic tape, whose ends are attached to two hubs or reels

## 3.5

#### container

box, can, or carton used for storage and shipping of recording materials

EXAMPLE The box into which a reel, cassette, cartridge or shell is placed is a container.

NOTE Reels, cassettes, cartridges or shells are not containers.

## 3.6

## dew-point

temperature at which moisture begins to condense on a surface, corresponding to saturation for a given absolute humidity

EXAMPLE The more humid the air, the higher the dew-point temperature.

## 3.7

## extended-term storage conditions

storage conditions suitable for the preservation of information recorded on the majority of magnetic tapes for 50 years

## 3.8

## fire-protective storage

facilities designed to protect records against excessive temperatures, water and other fire-fighting agents, and steam developed by insulation of safes or caused by the extinguishing of fires and collapsing structures

## 3.9

## flange

fixed or removable circular disc, which is connected to the hub to make a reel for the purpose of protecting the roll of recording material

SEE reel (3.21)

## 3.10

#### heads out

configuration of magnetic tape stored on its reel, or in its cassette, such that the tape is positioned to play from the beginning of the recorded information

## 3.11

hub

cylindrical object at the centre of the tape reel, around which the recording material is wound

## 3.12

## leader

flexible plastic or paper strip which can be spliced to either end of a roll of recording material

## 3.13

leafing

multiple popped strands in a magnetic-tape wind

## SEE popped strand (3.19) and stepped pack (3.29)

## 3.14

life expectancy LE

## iTeh STANDARD PREVIEW (standards.iteh.ai)

length of time that information is predicted to be retrievable in a system

## 3.15

https://standards.iteh.ai/catalog/standards/sist/c218858a-33c0-47cd-b822-1fe026b5e7cd/iso-18923-2000

## loose pack

undesirable pack condition in a roll of recording material, such that the outer portion of the roll can be moved and tightened by pulling on the end

## 3.16

## magnetic field intensity

level of the magnetic field at a point in space

## 3.17

medium

## media, pl

material on which the information is recorded

## 3.18

## medium-term storage conditions

storage conditions suitable for the preservation of recorded information for a minimum of 10 years

## 3.19

## popped strand

lateral displacement of a single strand or wrap of magnetic tape extending beyond the plane of the tape pack

SEE leafing (3.13) and stepped pack (3.29)

## 3.20

## print-through

unwanted transfer of a magnetic field and its signal from one tape lap to another within a roll of magnetic tape

## 3.21

## reel

## spool

hub or core with flanges (protective sides) onto which recording material is wound

## 3.22

## relative humidity

## RH

ratio, defined as a percentage, of the existing partial vapour pressure of water to the vapour pressure at saturation

NOTE It is usually, but not always, equal to the percentage of the amount of moisture in the air to that at saturation.

## 3.23

## shell

cassette/cartridge housing for magnetic tape

## 3.24

## slot

space or slit in the hub or reel surface

## 3.25

splice

union of two pieces of recording material to form a single piece

## 3.26

## splicing tape paper or plastic strip coated with a thermal-or pressure-sensitive adhesive, used in splicing (standards.iteh.ai)

## 3.27

## spoking

deformations in a roll pack that appear radially outward and disrupt the circular nature of the wind

https://standards.iteh.ai/catalog/standards/sist/c218858a-33c0-47cd-b822-1fe026b5e7cd/iso-18923-2000

#### 3.28 staging

process of conditioning material from one set of temperature/moisture conditions to another

## 3.29

## stepped pack

multiple adjacent strands of magnetic tape extending beyond the level of a tape pack

## SEE leafing (3.13) and popped strand (3.19)

## 3.30

## storage environment

conditions for storing materials, i.e., temperature, relative humidity, cleanliness of facilities, and atmospheric pollutants

## 3.31

## storage housing

physical structure supporting materials and their enclosures

NOTE It may consist of drawers, racks, shelves or cabinets.

## 3.32

## system

material, hardware, software and documentation necessary for recording and/or retrieving information

## 3.33

## tape pack

length of magnetic tape wound on a reel or hub

## 3.34

#### tails out

configuration of magnetic tape stored on its reel or in its cassette, such that the tape should be fully rewound in order to correctly play from the beginning of the recorded information

## 3.35

wind

 $\langle appearance \rangle$  physical appearance and tension of the magnetic tape pack

## 3.36

wind

(process) process of transferring a roll of recording material from one spool or reel to another

## 4 Environmental conditions

## 4.1 Humidity and temperature limits

## 4.1.1 Medium-term storage environment

The average relative humidity of a medium-term storage environment shall not exceed 50 % RH and shall not be lower than 15 % RH. The maximum temperature for prolonged periods shall not exceed 23 °C (see Table 1). The peak temperature for short time periods shall not exceed 32 °C. Tape should not be stored below 8 °C due to a potential problem with lubricant separation from the binder.

## iTeh STANDARD PREVIEW

Cycling of temperature shall not be greater than  $\pm 2$  °C over a 24 h period. Cycling of relative humidity shall not be greater than  $\pm 10$  % over a 24 h period. Protection increases by storing tape at low temperature and/or low relative humidity.

#### ISO 18923:2000

## 4.1.2 Extended-term storage environment talog/standards/sist/c218858a-33c0-47cd-b822-

1fe026b5e7cd/iso-18923-2000

The rate of chemical reactions, such as the degradation of the tape base and the polymer binder layer, is lowered with decreasing temperature and decreasing relative humidity. Consequently, life expectancy is increased as storage temperature and/or storage humidity are lowered within the range of recommended storage.

A lower storage temperature can compensate for a higher humidity to provide the same life expectancy (see informative annex D) and a wider relative humidity range can be tolerated. For this reason, several relative humidity/temperature combinations can be used for an extended-term storage environment as specified in Table 1.

The majority of tapes fail due to hydrolysis of the binder. The storage conditions given in Table 1 are based on predictions of binder stability for the majority of polyester-base tapes. The maximum temperature shall not exceed 23 °C and storage of tape below 8 °C is not recommended. When low-temperature storage is used, attention shall be given during warm-up to avoid moisture condensation (see 7.1). Cycling of relative humidity in the storage environment shall not be greater than  $\pm$  5 % and cycling of temperature shall not be greater than  $\pm$  2 °C over a 24 h period. It should be recognized that while tape reaches temperature equilibrium quickly, it takes a long time for a tape pack to attain moisture equilibration (see informative annex E).

It is impossible to specify the best relative humidity and storage temperature for any facility since they depend upon the value of the material, the past storage history, the length of time that the tape is to be kept, the size of the vault, the cost of various options, and the climate conditions where the facility is located. Lower temperatures with the specified relative humidity range may be difficult to achieve with air-conditioning equipment operating at normal humidity and may require a specialized installation.

Properly controlled air conditioning may be necessary for maintaining humidity and temperature within the limits specified. The fundamentals of air conditioning are given in the three ASHRAE publications listed in clause 2. Automatic control systems are recommended, and they shall be checked frequently enough to determine that the temperature and humidity limits specified in Table 1 are not being exceeded. A reliable hygrometer may be used for humidity measurements.